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红树林湿地不同植物生境大型底栖动物群落研究

Macrofaunal Communities in different botanical biotopes in the mangrove wetland

许 鹏

指导教师姓名：蔡立哲 教授

专 业 名 称：环境科学

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摘 要

近年来，红树林生态恢复和服务功能的研究备受重视。红树林湿地是我国南部沿海潮间带的典型生态系统，大型底栖动物群落是潮间带红树林湿地的的重要组成部分，对大型底栖动物群落结构的研究，能够使我们了解潮间带红树林湿地的许多重要生态过程。通过对红树林区不同植物生境下大型底栖动物群落结构、多样性、功能群的研究，可以为红树林生态系统的恢复、保护、开发和管理提供科学依据。

本文选取福建漳江口红树林国家级自然保护区和广东湛江红树林国家级自然保护区为研究区域，于 2010 年对两片红树林区四种不同植物生境进行了大型底栖动物的季度调查，同时测定环境理化因子。采用单变量和多变量的方法分析了不同植物生境大型底栖动物的群落结构、多样性、次级生产力和功能群等的差异。主要研究成果如下：

1. 漳江口云霄红树林区定量取样共获得大型底栖动物 57 种，其中多毛类、甲壳类、腹足类、双壳类分别为 15 种、15 种、14 种和 4 种；互花米草生境获得的大型底栖动物物种数最多，为 36 种。湛江高桥红树林区定量取样共获得大型底栖动物 58 种，其中多毛类、甲壳类、腹足类、双壳类分别为 18 种、18 种、10 种和 3 种；桐花树生境获得的大型底栖动物物种数最多，为 31 种。

2. 云霄红树林区大型底栖动物平均密度为 3327.2 ind m^{-2}，各植物生境密度为互花米草＞白骨壤＞秋茄＞桐花树；大型底栖动物平均生物量为 24.41 g m^{-2}，各植物生境生物量则为白骨壤＞秋茄＞桐花树＞互花米草。高桥红树林区大型底栖动物平均密度为 2803.0 ind m^{-2}，各植物生境密度为桐花树＞木榄＞无瓣海桑＞盐地鼠尾粟；大型底栖动物平均生物量为 85.43 g m^{-2}，各植物生境生物量为桐花树＞无瓣海桑＞盐地鼠尾粟＞木榄。

3. 云霄红树林区大型底栖动物丰富度指数 *d* 为秋茄＞白骨壤＞互花米草＞桐花树；种类多样性指数 H’为桐花树＞秋茄＞白骨壤＞互花米草；大型底栖动物污染指数 MPI 则为互花米草＞白骨壤＞秋茄＞桐花树。高桥红树林区大型底栖动物丰富度指数 *d* 为盐地鼠尾粟＞无瓣海桑＞桐花树＞木榄；种类多样性指数

*H'*为盐地鼠尾粟＞桐花树＞木榄＞无瓣海桑；大型底栖动物污染指数 MPI 则为木榄＞无瓣海桑＞桐花树＞盐地鼠尾粟。

4. 聚类分析和 MDS 标序结果表明，云霄三种红树植物生境的大型底栖动物群落结构比较相似，互花米草生境与三种红树植物生境的大型底栖动物群落结构相似性较低；高桥三种红树植物生境的大型底栖动物群落结构也较相似，盐地鼠尾粟生境与红树植物生境的大型底栖动物群落结构相似性也较低。可见，盐沼植物生境大型底栖动物群落与红树植物生境大型底栖动物群落不太相似。

5. 云霄红树林区大型底栖动物物种数、丰度指数、均匀度指数、多样性指数与沉积物温度显著负相关；大型底栖动物物种数、丰度指数、均匀度指数、多样性指数与盐度呈显著正相关；大型底栖动物均匀度指数、多样性指数与有机质呈显著相关。高桥红树林区大型底栖动物物种数与沉积物温度、盐度和有机质呈显著相关。

6. 云霄红树林区大型底栖动物平均次级生产力为 3.79 g(AFDW)/(m^2 a)，其中各取样生境的大小顺序是白骨壤＞互花米草＞秋茄＞桐花树，各季节大型底栖动物平均次级生产力从高到低的排列顺序是：4 月份＞10 月份＞1 月份＞7 月份；高桥红树林区大型底栖动物平均次级生产力为 5.34 g(AFDW)/(m^2 a)，其中各取样生境的大小顺序是桐花树＞无瓣海桑＞盐地鼠尾粟＞木榄，各季节大型底栖动物平均次级生产力从高到低的排列顺序是：7 月份＞1 月份＞10 月份＞4 月份。

7. 云霄各取样生境大型底栖动物物种数均以植食者居多，高桥各取样生境大型底栖动物食性比例不同，如木榄生境杂食者和碎屑食者均为 7 种，桐花树、盐地鼠尾粟、无瓣海桑分别以肉食者、植食者和碎屑食者物种数居多。红树林和互花米草生境大型底栖动物碎屑食者密度占总密度 80%以上，盐地鼠尾粟生境大型底栖动物浮游生物食者密度占总密度的 50.9%。

关键词：红树林区；大型底栖动物；群落结构；功能群；次级生产力

Abstract

In recent years, the research on mangrove restoration and ecosystem service become more and more important. The mangrove wetland is a typical ecosystem of coastal intertide zone in south China while the macrofauna community is a crucial part of intertidal mangrove wetland. Through the research on the structure of the macrofauna community, we can learn many important ecological process of intertidal mangrove wetland. To provide scientific basis for the mangrove ecosystem restoration, protection, exploiture and management, we need to realize the structure and the diversity as well as the fuctional feeding groups of the macrofauna community.

Fujian Zhangjiangkou Mangrove National Nature Reserve and Guangdong Zhanjiang Mangrove National Nature Reserve were choosed as research area. Macrobenthos and environmental factors were investigated seasonally at four different plant biotopes in each mangrove reserve in 2010. The analysis of the differences of the structure, the diversity, the secondary production and the fuctional feeding group of the macrofauna community among different biotopes of plants was discussed by using univariate and multivariable statistics. The main results are as follows:

1. Fifty-seven species of macrofauna were identified in Yunxiao Zhangjiangkou mangrove reserve. Among them, fifteen species belonged to Polychaeta, fifteen species of Crustacean, fourteen species of Gastropoda and four species of Bivalvia. In the biotope of *Spatina alterniflora*, we collected more macrofaunal species than that in mangrove biotope. Fifty-eight species of macrofauna were identified in Zhanjiang Gaoqiao mangrove reserve. Among them, eighteen species belonged to Polychaeta, eighteen species of Crustacean, ten species of Gastropoda and three species of Bivalvia. In the biotope of *Aegiceras corniculatum*, we collected more macrofaunal species than that in other mangrove biotopes.

2. In Yunxiao mangrove reserve, the average density of macrofauna was 3327.2

ind m^{-2} and the average biomass of macrofauna was 24.41 g m^{-2}. The highest average density was in the biotope of *Spatina alterniflora* while the lowest was in the biotope of *Aegiceras corniculatum*; the highest average biomass was in the biotope of *Avicennia marina* while the lowest was in the biotope of *Spatina alterniflora*. In Gaoqiao mangrove reserve, the average density of macrofauna was 2803.0 ind m^{-2} and the average biomass of macrofauna was 85.43 g m^{-2}. The highest average density was in the biotope of *Aegiceras corniculatum* while the lowest was in the biotope of *Sporobolus virginicus*; the highest average biomass was in the biotope of *Aegiceras corniculatum* while the lowest was in the biotope of *Bruguiera conjugata*.

3. In Yunxiao mangrove reserve, the highest Magalef's index (*d*) was in the biotope of *Kandelia candel* while the lowest was in the biotope of *Aegiceras corniculatum*; the highest Shannon-Wiener diversity index (H') was in the biotope of *Aegiceras corniculatum* while the lowest was in the biotope of *Spatina alterniflora*; the highest Macrofaunal Pollution Index (MPI) was in the biotope of *Spatina alterniflora* while the lowest was in the biotope of *Aegiceras corniculatum*. In Gaoqiao mangrove reserve, the highest Magalef's index (*d*) was in the biotope of *Sporobolus virginicus* while the lowest was in the biotope of Bruguiera conjugata; the highest Shannon-Wiener diversity index (H') was in the biotope of *Sporobolus virginicus* while the lowest was in the biotope of *Sonneratia apetala*; the highest Macrofaunal Pollution Index (MPI) was in the biotope of *Bruguiera conjugate* while the lowest was in the biotope of *Sporobolus virginicus*.

4. The Bray-Curtis Cluster and MDS analysis showed that：In Yunxiao mangrove reserve, the structure of the macrofauna community in the three biotopes of the mangrove plants were similar, and the differences of the structure of the macrofauna community were exist between the biotope of *Spatina alterniflora* and these three biotopes; we got the same result in Gaoqiao mangrove reserve, the structure of the macrofauna community in the biotope of *Sporobolus virginicus* were much different from the other three biotopes of the mangrove plants. It's thus clear that the structure of the macrofauna community between biotopes of the mangrove plants and biotopes of the saltmarsh plants was different.